1 Question

Evaluate $\displaystyle\int_{-1}^{3} \frac{5x}{\sqrt{x^2+4}} dx$

Answer

$$\int_{-1}^{3} \frac{5x}{\sqrt{x^2+4}}\, dx$$

$$= \int_{\sqrt{5}}^{\sqrt{13}} 5\, dt$$

Put $\sqrt{x^2+4} = t$

$\therefore \dfrac{2x\, dx}{2\sqrt{x^2+4}} = dt$

$\therefore \dfrac{x\, dx}{\sqrt{x^2+4}} = dt$

At $x = -1, t = \sqrt{5}$

At $x = 3, t = \sqrt{13}$

$$= [\ 5t\ ]_{\sqrt{5}}^{\sqrt{13}}$$

$$= 5(\sqrt{5} - \sqrt{13})$$

2 Question

Evaluate $\displaystyle\int_{1}^{2} \frac{e^{\frac{1}{x}}}{x^2}\, dx$

Answer

$$\int_{1}^{2} \frac{e^{\frac{1}{x}}}{x^2}\, dx$$

$$= -\int_{e}^{\sqrt{e}} dt$$

Put $e^{\frac{1}{x}} = t$

$\therefore -\dfrac{e^{\frac{1}{x}}}{x^2}\, dx = dt$

$\therefore \dfrac{e^{\frac{1}{x}}}{x^2}\, dx = -dt$

At $x = 1, t = e$

At $x = 2, t = e^{\frac{1}{2}} = \sqrt{e}$

$$= [\ t\ ]_{e}^{\sqrt{e}}$$

$$= \sqrt{e} - e$$